

What is claimed is:

1. A substrate processing method comprising:

5 preparing a substrate having a metal region on a surface thereof;

performing a pre-plating treatment by bringing a pretreatment liquid into contact with the surface of the substrate to modify the entire surface thereof;

10 removing the pretreatment liquid remaining on the surface of the substrate in a rinsing treatment;

performing an electroless plating process on the surface of the substrate to selectively form an alloy film on the surface of said metal region; and

15 post-cleaning the substrate after the electroless plating process and drying the substrate.

2. A substrate processing method according to claim 1, wherein said metal region comprises an exposed surface of an embedded interconnect formed in an insulator.

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3. A substrate processing method according to claim 1, wherein said metal region comprises a metal film formed on the bottom and side surfaces of a recess for an embedded interconnect formed in the surface of an insulator.

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4. A substrate processing method according to claim 1, wherein said metal region comprises an exposed surface of a metal interconnect formed in the surface of an insulator.

5. A substrate processing method according to claim 1,
wherein said pre-plating treatment comprises a treatment of
purifying the surface of the substrate and simultaneously
5 imparting a catalyst to said metal region to activate the
surface of the metal region.

6. A substrate processing method according to claim 1,
wherein said pre-plating treatment and said rinsing
10 treatment are performed by ejecting a chemical solution or
pure water from a nozzle toward the surface of the substrate
which faces downwardly.

7. A substrate processing method according to claim 6,
15 wherein said pre-plating treatment and said rinsing
treatment are performed while the substrate is being
rotated.

8. A substrate processing method according to claim 6,
20 wherein a nozzle used in said pre-plating treatment and a
nozzle or nozzles used in said rinsing treatment are
connected to respective different flow path systems.

9. A substrate processing method according to claim 1,
25 wherein said pre-plating treatment is performed by immersing
the substrate in the pretreatment liquid.

10. A substrate processing method according to claim 1,
wherein the substrate is rotated at a higher speed after
said pre-plating treatment is completed.

5 11. A substrate processing method according to claim 5,
wherein said pre-plating treatment is performed using the
pretreatment liquid which is prepared by mixing at least
together catalytic metal ions and an acid having a function
to purify the surface of the substrate.

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12. A substrate processing method according to claim 1,
wherein said rinsing treatment is performed by cleaning the
surface of the substrate with pure water or pure water
having a reducing capability increased by electrolysis or
15 dissolving a hydrogen gas.

13. A substrate processing method according to claim 1,
wherein said rinsing treatment is performed by cleaning the
surface of the substrate with an aqueous liquid prepared by
20 mixing one component or some components of an electroless
plating solution.

14. A substrate processing method according to claim 1,
wherein said pre-plating treatment and said rinsing
25 treatment are performed in an atmosphere having less oxygen
than the atmosphere.

15. A substrate processing method according to claim 1, wherein said electroless plating process is performed in an atmosphere having less oxygen than the atmosphere.

5 16. A substrate processing method according to claim 1, wherein at least one of a film thickness and a film property of said alloy film is measured after the substrate is post-cleaned and dried.

10 17. A substrate processing method according to claim 1, wherein the compositions and component concentrations of said pretreatment liquid and a rinsing liquid therefore, and the temperature of said pretreatment liquid are kept in predetermined ranges.

15 18. A substrate processing method according to claim 1, wherein the concentration of an impurity mixed in said pretreatment liquid in said pre-plating treatment is measured, and the impurity is removed when the impurity
20 reaches a predetermined concentration.

19. A substrate processing method according to claim 1, wherein said electroless plating process is performed by keeping the temperature, composition, and component
25 concentrations of a plating solution in predetermined ranges, and controlling a plating process time with respect to a predetermined film thickness.

20. A substrate processing apparatus comprising:

a pretreatment unit for performing a pre-plating treatment by bringing a surface of a substrate having a metal region into contact with a pretreatment liquid to
5 modify the entire surface of the substrate, and a rinsing treatment for rinsing the pretreatment liquid remaining on the surface of the substrate after the pre-plating treatment;

an electroless plating unit for performing an
10 electroless plating process on the surface of the substrate after the pre-plating treatment to selectively form an alloy film on the surface of said metal region; and

a post-treatment unit for post-cleaning the substrate after the electroless plating process and drying the
15 substrate.

21. A substrate processing apparatus according to claim 20, wherein said pre-plating treatment comprises a treatment of purifying the surface of the substrate and simultaneously
20 imparting a catalyst to said metal region to activate the surface of the metal region.

22. A substrate processing apparatus according to claim 20, wherein said pretreatment unit has a function to
25 separate the pretreatment liquid used in said pre-plating treatment and a rinsing liquid used in said rinsing treatment from each other after the substrate is treated.

23. A substrate processing apparatus according to claim
20, wherein said pretreatment unit includes a liquid
purifying device having a liquid purifying function to
measure the concentration of an impurity mixed in said
5 pretreatment liquid in said pre-plating treatment and to
remove the impurity when the concentration of the impurity
reaches a predetermined value.

24. A substrate processing apparatus according to claim
10 20, further comprising:

a device for measuring at least one of a film thickness
and a film property of the alloy film formed on the
substrate dried by said post-processing unit.

15 25. A substrate processing apparatus according to claim
24, wherein a plating condition is changed or the quality of
the deposited film is determined based on a measured value
from the device for measuring at least one of the film
thickness and the film property.

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26. A substrate processing apparatus according to claim
20, wherein said pretreatment unit and said electroless
plating unit are arranged to process the surface of the
substrate which faces in the same orientation.

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27. A substrate processing apparatus according to claim
20, wherein said pretreatment unit and said electroless
plating unit have a common substrate holding head.

28. A substrate processing apparatus according to claim
27, wherein said substrate holding head is arranged to seal
simultaneously or selectively one of a peripheral portion of
5 a face side of the substrate and a peripheral portion of a
reverse side of the substrate.

29. A substrate processing apparatus according to claim
20, wherein said pretreatment unit and said plating unit are
10 disposed in a housing having an opening defined in a portion
thereof and a function to adjust an atmosphere therein
independently of the apparatus in its entirety.

30. A substrate processing apparatus according to claim
15 20, wherein the substrate processing apparatus is housed in
a housing shielded against transmission of light from an
external environment.